PSY 3393
Experimental Projects
Spring 2008

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Project 1 assignment

Stroop effect Due: **Feb 19**

1. **Title**
2. **Abstract**
3. **Introduction** – turn in draft today **Jan 24**
4. **Method** – turn in draft **Jan 31**
5. **Results**
6. **Discussion**
7. **References**

The *t*-test

- The *t*-test is used to determine whether the means of two samples differ significantly.
- There are two forms:
  - **Correlated** means *t*-test
  - **Independent** means *t*-test

Excel spreadsheet for *t*-tests

A	B	A-B	(A-B)^2	A^2	B^2			
5	1	4	16	25	1			
8	0	8	64	64	0		Independent means *t*-test	
16	9	7	49	256	81		mean(A) - mean(B)	7.3
10	3	7	49	100	9		(N1-1)*s1^2	1075.75
13	2	11	121	169	4		(N2-1)*s2^2	226.95
13	3	10	100	169	9		*t* =	3.9427
30	15	15	225	900	225		*p* =	0.00017
4	3	1	1	16	9		*df* =	38
19	1	18	324	361	1			
2	4	-2	4	4	16		Correlated means *t*-test	
4	0	4	16	16	0		ΣDi=	146
8	1	7	49	64	1		ΣDi^2=	1836
7	1	6	36	49	1		(ΣDi)^2=	21316
8	5	3	9	64	25		*t* =	5.1276
28	3	25	625	784	9		*p* =	0.00003
8	4	4	16	64	16		*df* =	19
11	3	8	64	121	9			
6	6	0	0	36	36			
10	2	8	64	100	4			
5	3	2	4	25	9			
10.75	3.45	146	1836	3387	465			
7.524521317	3.456115861							
20	20							

http://www.utdallas.edu/~assmann/PSY3393/ttest.xls

Homework assignment #1

- Write a brief paragraph summarizing the results of applying a *t*-test to the data we collected in class to test the hypothesis that memorization improves with repeated testing of the same items. The Excel *t*-test data file can be downloaded from the class web page:

http://www.utdallas.edu/~assmann/PSY3393/ttest.xls

| First test	Second test
6	11
7	12
4	6
6	10
5	8
6	10
10	12
9	10
10	17
10	13
10	18
6	9
8	12
5	8
8	9
7	9
12	15

Example

Participants generated more errors when they scanned the word list on a computer monitor (*M*=72.44; *S.D.*=8.33) than on a printed page (*M*=55.13; *S.D.*=7.96). A *t*-test for independent means confirmed that this difference was statistically significant, $t(19)=5.66$; $p<0.01$.

Observations on *t*-tests

- How does sample size affect the value of *t*?
- What happens to *t* as the difference between groups is increased?
- What happens to *t* as the variability across subjects is increased?
- How is *t* affected by replacing a within-subjects design with between-subjects (assuming the scores in the two groups remain the same)?
- Exercise: use the *t*-test spreadsheet to verify your conclusions.

Statistical Tests
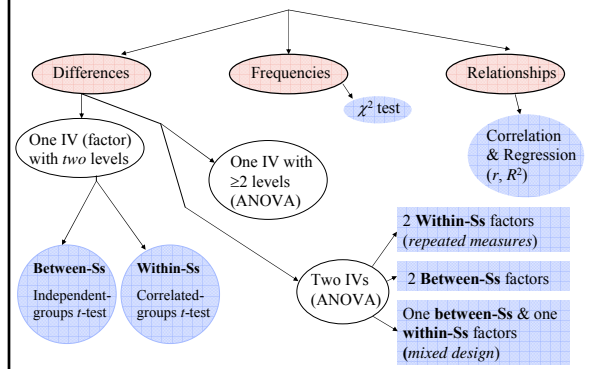
Chi-squared (χ^2) test

- A chi-squared (χ^2) test is used when the data are in the form of a frequency table: counts of the number of occurrences of each of a set of mutually exclusive categories.
- Example: conduct a survey in your local mall to find out if shoppers who are parents are more likely to be male or female (or *vice versa*).

Chi-squared (χ^2) test

- A chi-squared (χ^2) test will provide an answer to the question: is there a *dependency* between the two variables?

	Men	Women
Children	253	248
No children	139	123

Chi-squared (χ^2) test

- Note that the categories must be *exhaustive* and *mutually exclusive*. No subject can belong to more than one category.

	Men	Women
Children	253	248
No children	139	123

Chi-squared (χ^2) test

- What is the null hypothesis (H_0)?
- What is the alternate hypothesis (H_1)?

	Men	Women
Children	253	248
No children	139	123

Chi-squared (χ^2) test

- The data table is called a **contingency table**. It asks whether belonging to a particular category (or level) of the first variable depends on (or *is contingent upon*) the category or level of the second variable.

Chi-squared (χ^2) test

- The chi-squared test calculates a set of *expected frequencies* (under the null hypothesis) and compares these frequencies to the actual *observed frequencies*.
- A large value of chi-squared indicates a significant discrepancy between expected and observed frequencies.

Chi-squared (χ^2) test

- Example (McCall, 1994)
  - A survey was conducted asking a sample of men whether family, career or some other activity provided greater personal satisfaction.
  - The survey was conducted twice: once in 1960 and again in 1993 to determine whether a change in attitudes had taken place.

Chi-squared (χ^2) test

- Example (McCall, 1994)

	Career	Family	Other	Total
Men in 1960	65	42	14	120
Men in 1993	25	68	17	110
	90	110	30	230

Reporting chi-squared test results

- See **APA manual,** p. 138

  $\chi^2 (4, N = 90) = 10.51, p=.03.$
- Sometimes authors also include the data in the form of a table. See pp. 149-151 for APA prescribed formats for tables.

Homework assignment #2

- Perform the χ^2 test on the data from the *sources of personal satisfaction* study.
- An Excel chi-squared calculator (developed by Dr. M. Plonsky, University of Wisconsin) can be downloaded from this page:
  http://www.uwsp.edu/psych/stat/14/nonparm.htm
  http://www.uwsp.edu/psych/stat/14/CHI2.XLS
- Use the Excel program to enter the data and follow the instructions to do the chi-squared test.

Homework assignment #2

- Write a single sentence summarizing the results of the test in APA format.
- In a separate sentence, provide an *interpretation* of the results. What conclusion does the test lead to?

Writing a good Introduction

- Start by looking at some examples of well-written Introduction sections.

•Examples:
  http://www.gmu.edu/departments/psychology/writing/samplelabreport.htm#samplein
  http://www.utdallas.edu/~assmann/aud6306/kuhl97.pdf
  http://www.utdallas.edu/~assmann/aud6306/lively_logan_pisoni93.pdf

Writing a good Introduction

- Opening paragraph should tell the reader what the study is about.
- If specialized terms are used these should be defined (as early as possible).
- Example: "Stroop effect" – cite the original study, describe what it is and explain why it is considered important.

Writing a good Introduction

1. What is the Stroop effect?
2. Why is it important?
   - Summarize theories and explanations
   - Review findings that support them

Writing a good Introduction

- Develop a clear rationale for your study
- Develop clear links to the literature.
- Replication: make it clear what aspects you are replicating and how your study differs from previous studies. Cite the relevant papers on the subject. This simplifies your task as the author and makes it easier for the reader to interpret your findings.

Use of the term "random"

- *Random* selection of participants means that every individual in the population is equally likely to appear in your study.
- Most studies use opportunistic (not random) sampling (college undergraduates enrolled in Psychology courses; friends and family members; volunteers).

Reference citations

- Use correct format for references.
- See p. 204-218 and chapter 4 of the APA manual for detailed coverage and examples.
  - Include *only* the author(s) surname(s) and the date when citing the study in the text.
  - Stroop (1935) *not* J. Ridley Stroop (1935)

Reference citations

- Smith (2007)
- Smith and Ross (2006)
- Smith, Ross and Sampson (2005) (1st citation)
- Smith et al. (2005) (in subsequent citations. Omit the year after the first citation within the same paragraph)
- 6 or more authors, use Smith et al. (2005) for *all* citations

Writing the Introduction

- What problem does your study address?
  - Describe the problem under investigation
  - Summarize relevant background material
  - Provide a review of previous research
  - Introduce concepts and define key terms

Writing the Introduction

- Why is it important?
  - Tell readers why you have chosen this topic.
  - Explain the problem or unanswered questions
  - State what is unique or novel about your study
  - Provide the background: explain how and why your study extends earlier work, investigates an untested population, or applies a new technique.

Writing the Introduction

- How do you propose to address the problem?
  - Outline your research strategy
  - State the research hypotheses
  - Describe your experimental design
  - Explain the advantages of doing it this way

Writing the Introduction

- Build a case for the approach you've chosen.
  - Discuss practical implications.
  - Discuss theoretical significance.
  - Develop clear links between past research and the present study, and between your research question and research design.
  - In your review of the literature, select previous studies that relate directly to your study.

Writing the Introduction

- Review the literature.
  - Start out with broad, general considerations, define your terms and gradually become more specific.
  - Review the *relevant* literature. No need to include *every* study on the subject.
  - Make the connection to the present study.

Writing the Introduction

- Set up clear research hypotheses.
  - From your research question, formulate research hypotheses and explain their rationale.
  - End the Introduction with an explicit statement of the purpose of the study.

Writing the Method section

- Purpose: to describe how the **research hypothesis** was *tested* experimentally
  - Does the method provide an adequate test of the research hypothesis formulated in the Introduction? Can you determine the null hypothesis from the description?
  - What are the independent, dependent, and control variables? Were any relevant controls omitted?

Method

- A well-written Method section provides *all* and *only* the necessary information that would allow another researcher to replicate your study and obtain the same results.
  - Are all the **important** details included? (How were participants recruited? What were their instructions? How was order controlled? … etc.)
  - Is there **too much** detail? (Does it really matter that the laboratory walls are painted green?)

Method

- The Method section is typically divided into four sub-sections:
  - Participants (Subjects)
  - Materials (Apparatus, Stimuli)
  - Design (may be combined with Procedure)
  - Procedure

Method

- **Participants**
  - Who partipated in the study?
  - How many participants were there?
  - How were they recruited?
  - What criteria were applied for their inclusion?
  - What was the motivation for participating?
  - Include *relevant* details (e.g. sex, age, ethnicity, weight, native language, musical experience, etc.)

Method

- **Materials / Apparatus**
  - Describe materials that were used and how they functioned in the experiment
  - For *special* equipment (e.g. sound level meter, polygraph, etc.) give model number, company, and place of manufacture
  - For *standard* equipment (e.g. stopwatch, pen and paper, personal computer) do not provide details; these are often described in the Procedure section
  - Be careful not to describe the *procedures* in the *Materials / Apparatus* section

Method

- **Design**
  - Optional; not really needed for a single-factor experiment.
  - Identify the dependent, independent and control variables.
  - For each independent variable, indicate their levels, and whether a *between-subjects* (independent), *within-subjects* (repeated), or *matched* design was used.
  - Describe how participants were assigned to groups (conditions, levels) and explain controls.

Method

- **Procedure**
  - Carefully summarize each step of the experimental procedure.
  - Describe stages or steps involved, including practice trials.
  - Include description of trials, sessions, tests
  - Describe the instructions to the participants.
  - Use appropriate labels to designate conditions (e.g. the *rote memory* group, or the *mismatched ink* condition)
  - Provide *all* and *only* the details needed to obtain the same results.